RESEARCH ARTICLE

Araştırma Makalesi

Yazışma adresi
Correspondence address
Fatih TURKOGLU
Department of General Surgery,
Faculty of Medicine,
Akdeniz University,
Antalya, Türkiye

drfatihturkoglu@hotmail.com

Geliş tarihi / *Received* : September 28, 2024
Kabul tarihi / *Accepted* : August 28, 2025

Bu makalede yapılacak atıf
Cite this article as
Turkoglu F, Cakin O.
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Akd Tıp D 2026;12: 1-11

Fatih TURKOGLU
Department of General Surgery,
Faculty of Medicine,
Akdeniz University,
Antalya, Türkiye

Ozlem CAKIN
Department of Internal Medicine,
Faculty of Medicine,
Akdeniz University,
Antalya, Türkiye

Factors Related to Mortality in Critically Ill Patients Hospitalized with Gastrointestinal Hemorrhage: A Cross-sectional Study from a University Hospital

Gastrointestinal Kanama ile Hastaneye Yatırılan Kritik Hastalarda Mortalite ile İlişkili Faktörler: Üniversite Hastanesinden Kesitsel Bir Çalışma

ABSTRACT

Objective

This study aims to ascertain the demographic characteristics, comorbidities, fundamental laboratory data and mortality predictors of patients with gastrointestinal (GI) bleeding admitted to the intensive care unit (ICU) by the application of scoring methods.

Material and Methods

Data of patients followed up in Akdeniz University Hospital Internal Medicine ICU between June 2019 and December 2023 were retrospectively reviewed. The Acute Physiology and Chronic Health Evaluation (APACHE)-II and Sequential Organ Failure Assessment (SOFA) scores of the patients were recorded within the initial 24 hours of ICU admission. The quantities of blood product replacements, laboratory findings, lactate concentrations, and endoscopic data were analyzed. The statistics were compared between the groups of survival and non-survival (deceased) patients.

Results

The study included 95 patients. The mortality rate in these patients was determined as 29.47%. The international normalized ratio (INR) and lactate levels of patients were found to be predictive of in-hospital mortality. Lactate and INR levels were markedly elevated in the mortality group, with an hazard ratio (HR) of 1.29 (95% confidence interval [CI]: 1.13-1.46, $p<0.001$) and a HR of 1.41 (CI: 1 includes.16-1.70, $p<0.001$).

Conclusion

Lactate and INR levels serve as independent risk indicators for mortality prediction in patients admitted to the ICU with GI bleeding and may be significant in the ICU follow-up of these patients.

Key Words

Intensive care, Gastrointestinal bleeding, Mortality

DOI: 10.53394/akd.1557717

ÖZ

Amaç

Bu çalışmanın amacı, yoğun bakım ünitesine (YBÜ) kabul edilen gastrointestinal (Gİ) kanamalı hastaların demografik özelliklerini, komorbiditelerini, temel laboratuvar verilerini ve mortaliteyi öngören parametreleri skorlama sistemlerini kullanarak belirlemektir.

Gereç ve Yöntemler

Haziran 2019 ile Aralık 2023 tarihleri arasında Akdeniz Üniversitesi Hastanesi İç Hastalıkları YBÜ'nde takip edilen hastaların verileri retrospektif olarak incelendi. Hastaların YBÜ'ne kabulünden sonraki ilk 24 saat içinde ölçülen SOFA ve APACHE-II skorları kaydedildi. Kan ürünü replasman miktarları, laboratuvar sonuçları, laktat düzeyleri ve endoskopi verileri incelendi. Bu veriler hayatta kalan ve ölen hasta gruplarında karşılaştırıldı.

Bulgular

Çalışmaya 95 hasta dahil edildi. Bu hastaların yoğun bakım takibi sonucunda mortalite oranı %29,47 olarak belirlendi. Hastaların INR ve laktat düzeylerinin hastane içi mortaliteyi öngörebileceği belirlendi. Artan laktat ve INR düzeyleri ölüm grubunda anlamlı olarak daha yüksekti (HR: 1,29; CI: 1,13-1,46 ve p<0,001, HR: 1,41; CI: 1,16-1,70 ve p<0,001).

Sonuç

Laktat ve INR düzeyleri, Gİ kanama ile YBÜ'ye kabul edilen hastalarda mortalite tahmini için bağımsız risk faktörleridir ve hastaların YBÜ takibinde önemli olabilir.

Anahtar Kelimeler

Yoğun bakım, Gastrointestinal kanama, Mortalite

INTRODUCTION

Gastrointestinal (GI) bleeding is the general name of bleeding occurring in any part of the GI tract from the mouth to the anus for any pathological reason. GI bleeding is classified into two groups: upper GI bleeding and lower GI bleeding. Upper GI bleeding is bleeding from the proximal part of the Treitz ligament (1). Acute GI bleeding is one of the most common and important gastroenterological problems. The estimated annual incidence rate for upper GI bleeding has been reported as 100/100,000 individuals, while for lower GI bleeding this rate has been reported as 20/100,000 individuals (2, 3). The patient's clinical condition varies depending on the severity of the hemorrhage. Research indicates that roughly 20% of patients admitted for GI bleeding necessitate intensive care unit (ICU) supervision. Acute GI bleeding is a significant reason for admission to ICUs. Moreover, it is one of the main causes of morbidity and mortality (4). The mortality rate in upper GI bleeding varies depending on the accompanying diseases and risk factors, but the mortality rate varies between 1% and 48.5% (5). Lower GI bleeding is self-limiting in 80% of cases and mortality rate in patients hospitalised for this reason is 2.4%. In patients who developed lower GI bleeding in the hospital, this rate was found to be 23.1% (6).

GI bleeding monitored in ICUs may transpire while the patient is in the ICU or the bleeding patient may be observed in the ICU. There are many studies in the literature on bleeding in the ICU, and the risk factors on this subject have been presented in detail. However, there are very limited studies on mortality determinants of bleeding outside the ICU. Consequently, this study investigated patients diagnosed with GI bleeding who were admitted to the ICU for treatment and monitoring. The objective of this study is to identify the factors that influence mortality in patients admitted with a diagnosis of GI bleeding.

MATERIAL and METHODS

Location, Duration and Ethical Approval of the Study

This research was performed at Akdeniz University Hospital, Internal Medicine ICU, from June 2019 to December 2023. Prior to commencing the study, approval from the Akdeniz University Faculty of Medicine Ethics Committee was obtained (Approval No: KAEK-520). All procedures were conducted in compliance with ethical guidelines and the principles outlined in the Declaration of Helsinki.

Study Method

This is a retrospective clinical study based on the collection of retrospective data. This study is of an observational nature.

Study Population

Patients monitored for a minimum of 24 hours in the

Akdeniz University Internal Medicine ICU were included in the study. Patients diagnosed with GI bleeding by a specialist in the emergency department and wards and who warranted ICU admission were included in the study. Moreover, patients for whom surgery was not planned or performed by the relevant department specialists after the initial evaluation and during treatment were examined. Patients referred to an external medical facility during hospitalization, those who died during the initial 24 hours and patients under 18 years of age were excluded from the study. Additionally, patients admitted to the ICU after cardiac arrest were not included in the study. Data from patients hospitalized in the ICU many times during the study period were included only from their initial stay.

Data Collection Methods

Demographic data such as age and gender, biochemical parameters at the time of admission, arterial blood gas (ABG), complete blood count and coagulation values, presence of chronic systemic diseases, endoscopic findings and clinical and laboratory data such as transfusion needs were obtained from patient monitoring documentation, daily examination forms, hospital electronic system records, physician assessment notes and records kept in the ward they were admitted to.

The APACHE II score was determined by utilizing the most severe values of each of the acute physiological parameters such as fever, blood pressure, heart rate, respiration rate recorded within the first day in the ICU. The SOFA score was derived from arterial oxygen saturation, fraction of inspired oxygen, serum creatinine, total bilirubin, platelet count, GCS score, MAP and data regarding the administration of vasopressors including dopamine, dobutamine, adrenaline and noradrenaline. ABG data collected upon admission and laboratory findings were analyzed. The blood product transfusions administered during the patients' ICU admission were analyzed. The duration of ICU hospitalization and the number of days on mechanical ventilation were determined.

Management Procedure

GI bleeding was identified through the observation of hematemesis, melena or hematochezia accompanied by a reduction in hemoglobin levels and/or through endoscopic and colonoscopic evaluations. Admitted patients were first monitored. Then necessary interventions were made according to mean arterial pressure (MAP), general clinical status and Glasgow Coma Scale (GCS). Blood component transfusion needs of patients were determined according to ICU replacement recommendations. In our ICU, we preferred a restrictive transfusion strategy in patient management within the scope of blood component replacement. We decided to perform red blood cell (RBC) transfusion when hemoglobin was < 7g/dL in patients. Our threshold value for platelet transfusion was 50,000/µL in patients with active bleeding and 20,000/µL in stable patients. In addition, although this was our general approach, there were cases where the treatment was customized to the patient by evaluating the clinical status of the patient and considering the hemodynamic parameters. Endoscopic treatment was also performed when necessary in patient management.

The patients included in the study were classified as either survival or non-survival according to the results of their stay in the ICU.

Statistical Analysis

Statistical evaluation was performed utilizing the Statistical Package for the Social Sciences (SPSS) version 26.0. The distribution characteristics of variables were inspected through both visual and analytical methodologies to assess normal distribution. Categorical variables were represented as frequencies (n) and percentages (%), with differential analyses conducted through the application of the chi-square test or Fisher's exact test. Continuous variables normally distributed were expressed via the mean ± standard deviation (SD), and comparative analyses between distinct groups were facilitated through the independent samples t-test. For data without normal distribution, median values [minimum-maximum] were presented, and comparative analysis between groups was executed utilizing the Mann-Whitney U test.

To elucidate the association of factors with in-hospital mortality cox-regression models were employed. The factors included in the models were determined via the results of the univariate analysis and according to existing literature. Model 1 included age (in years), sex (female), multimorbidity, location of bleeding (upper GI), and lactate levels. Different from Model 1, Model 2 included C-reactive protein (CRP)/Albumin ratio instead of lactate levels, and Model 3 included INR instead of lactate levels. The outcomes were stated as hazard ratios (HRs) with their respective 95% Confidence Intervals (CIs). The appropriateness of model fit was evaluated through the concordance index. All p-values reported were based on bi-directional hypotheses and were evaluated with a significance threshold of 5%.

Furthermore, the predictive ability of factors was assessed through Receiver Operating Characteristics (ROC) curve analysis, with the Area Under Curve (AUC) presented alongside 95% confidence intervals (CIs), adhering to a significance level of 5% ($p < 0.05$).

RESULTS

The study population consisted of 95 patients admitted to the ICU due to GI bleeding. 30 of the patients were female and 65 were male. The mean age of the study population was 66.1±17.7 years, with 31.6% identifying as female. Within the entire study cohort, 76.8% of patients had upper GI hemorrhage, whereas 25.3% experienced lower GI bleeding. The mortality rate during hospitalization was 29.5%.

The patients were classified into survival and non-survival groups based on their survival status during ICU hospital-

ization. Table I shows the demographic and clinical characteristics of patients according to in-hospital mortality. No differences were seen between the two groups based on sex; however, the mean age of the non-survival group was considerably higher than that of the survival group (p=0.031). Lower GI hemorrhage was more prevalent in the non-survival group; however, the difference was not statistically significant (p=0.13). Conversely, a greater proportion of patients with upper GI bleeding survived compared to those who died, although this difference again lacked statistical significance (p=0.061). The most common cause of death was multiple organ failure (MOF) (n=7, %25) and the rarest cause was acute renal failure (n=3, %10.7).

Hematemesis was more frequent in the survival group than in non-survival group, however the difference was not significant (p=0.055). Hematochezia was more frequent in the non-survival group than in survival group and the difference was statistically significant (p=0.016). There was no difference in melena between the two groups (p=0.74). Multimorbidity (the simultaneous presence of two or more diseases) was substantially more prevalent in the non-survival group compared to the survival group (71.4% vs 49.3%, p=0.047). When the comorbidities were compared in detail between the two groups; no statistically significant difference was found in terms of hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), heart failure, pulmonary disease, inflammatory bowel disease (IBD), cerebrovascular accident, dementia, cirrhosis, hepatic encephalopathy, malignancy, while a significant difference was found in terms of atrial fibrillation and renal disease (p=0.002, p=0.008 respectively). No difference was observed between the groups in terms of length of stay in ICU. Since we evaluated in-hospital mortality, the date of death was considered as the day of discharge due to death. It was found that patients in the non-survival group died in an average of 4.5 days.

The parameter "Mechanical Ventilation, before ICU" given in table I is the analysis of whether the patients were intubated and mechanically ventilated before being admitted to the ICU. Accordingly, two patients (3%) from the survival group and nine patients (32.1%) from the non-survival group were admitted to the ICU being intubated and receiving mechanical ventilation. This data is statistically significant (p<0.001). There was no significant difference between the groups when the number of days on mechanical ventilation was compared with each other.

Table II presents data on patients' medications, hemodynamic parameters, laboratory findings, and intensive care unit scoring systems. In the non-survival group, 50.0% (n=14) of patients required platelet transfusion, but in the survival group, the percentage was 25.4% (n=17), with the difference being statistically significant. Nonetheless, no difference was observed for RBC transfusion. In addition, both groups were compared in terms of RBC and platelet transfusion amounts and statistically significant results were obtained (p=0.002 and p=0.002 respectively). No differences were observed regarding the use of antiaggregant, anticoagulant or steroid.

MAP and systolic blood pressure measurements of the patients at ICU admission were significantly lower in the nonsurvival group (p=0.024 and p=0.031, respectively). Vasopressors were needed in 21 (31.3%) survival group patients and 28 (100%) non-survival group patients.
The CRP levels were higher in the non-survival group than in survival group at admission (p=0.004). Furthermore, albumin levels at admission were 29.6 [17.0-39.2] mg/dl in the non-survival group and 27.5 [10.3-37.8] mg/dl in the survival group (p=0.014). Moreover, CRP/Albumin ratio was found 2.6 [0.5-10.7] in the non-survival group and it was 0.9 [0.2-8.5] in the surviving group (p=0.002).

INR was found to be 1.3 [1.1-2.6] in the survival group and 1.8 [1.2-12.0] in the non-survival group, the difference was significant (p<0.001). Lactate levels at admission were substantially higher in the non-survival group (4.0 [0.7-16.6]) than in the survival group (1.6 [0.6-1.1]), (p<0.001). The ICU prognostic scores regarding APACHE II and SOFA were higher in the non-survival group than in the survival group while GCS were lower (p<0.001 for all). The use of fresh frozen plasma (FFP) in patients in the non-survival group was determined to be a median of 11.5 units [6–13], while in patients in the survival group it was a median of 8.5 units [1–16]; this difference was not found to be statistically significant (p=0.060). This result indicates that there is no statistically significant relationship between the use of FFP and mortality.
A significant correlation was found between the need for vasopressors and lactate levels. Lactate levels were higher in patients who received vasopressors compared to those who did not (p<0.001) (Table III).

The Cox-regression analysis of the factor that could affect in-hospital mortality is presented in table IV. According to model 1 higher lactate levels are significantly associated with an increased risk for in-hospital mortality regardless of age, sex, multimorbidity and location of the bleeding (HR: 1.29, 95% CI: 1.13-1.46 and p<0.001). However, the CRP/Albumin ratio does not significantly affect the risk for mortality. In model 3, it was found that a higher INR was significantly associated with an increased risk for mortality (HR: 1.41, 95% CI: 1.16-1.70 and p<0.001). Also, it was found that other factors such as age, sex, multimorbidity, upper GI bleeding and CRP/Albumin ratio did not show a significant association with mortality across the models.

The endoscopic (gastroscopic and colonoscopic) data of the patients and the detected causes of bleeding are shown in table V. The causes of bleeding included ulcerative lesions, gastritis, bulbitis, varicose veins, mass, and diverticular disease. In addition, endoscopic therapeutic proce-

Table I. Demographic and clinical characteristics of the patients according to in-hospital mortality

	Survival (n=67)	Non-survival (n=28)	p
Age, years	63.9 ± 19.2	71.2 ± 12.3	***0.031***
Sex, Female	22 (32.8)	8 (28.6)	*0.68*
Upper GI	55 (82.1)	18 (64.3)	*0.061*
Lower GI	14 (20.9)	10 (35.7)	*0.13*
Bleeding Pattern			
-Hematemesis	36 (53.7)	9 (32.1)	***0.055***
-Hematochezia	11 (16.4)	11 (39.3)	***0.016***
-Melena	19 (28.4)	7 (25.0)	*0.74*
Multimorbidity	33 (49.3)	20 (71.4)	***0.047***
Comorbidities			
-Hypertension	30 (44.8)	12 (42.9)	*0.86*
-Diabetes Mellitus	20 (29.9)	8 (28.6)	*0.90*
-Coronary Artery Disease	11 (16.4)	4 (14.3)	*0.80*
-Heart Failure	7 (10.4)	7 (25.0)	***0.068***
-Atrial Fibrillation	4 (6.0)	9 (32.1)	***0.002***
-Pulmonary Disease	9 (13.4)	3 (10.7)	*1.0*
-Renal Disease	2 (3.0)	6 (21.4)	***0.008***
-Inflammatory Bowel Disease	3 (4.5)	-	-
-Cerebrovascular Accident	8 (11.9)	3 (10.7)	*1.0*
-Dementia	6 (9.0)	2 (7.1)	*1.0*
-Cirrhosis	19 (28.4)	5 (17.9)	*0.28*
-Hepatic Encephalopathy	2 (3.0)	2 (7.1)	*0.58*
-Malignancy	7 (10.4)	2 (7.1)	*0.62*
Length of stay in ICU, days	3 [1-25]	4.5 [1-23]	*0.44*
Mechanical Ventilation			
-Mechanical Ventilation, days	3.0 [1.0-15.0]	3.0 [1.0-23.0]	*0,85*
-Mechanical Ventilation, before ICU	2 (3.0)	9 (32.1)	***<0.001***
Transfusion			
-RBC transfusion, patient	61 (91.0)	27 (96.4)	*0.36*
-Platelet transfusion, patient	17 (25.4)	14 (50.0)	***0.02***
-RBC transfusion, unit	4.0 [0.0-23.0]	9.0 [0.0-22.0]	***0.002***
-Platelet transfusion, unit	0.0 [0.0-20.0]	1.0 [0.0-18.0]	***0.002***

GI: gastrointestinal, ICU: intensive care unit, RBC: red blood cell

Table II. Medications, haemodynamic parameters, laboratory findings and intensive care unit scoring systems of the patients

	Survival (n=67)	Non-survival (n=28)	p
Medication			
-Anticoagulant Use	12 (17.9)	4 (14.3)	*0.66*
-Antiaggregant Use	14 (20.9)	7 (25.0)	*0.66*
-Steroid Use	10 (14.9)	3 (10.7)	*0.59*
-Vasopressor Agent Use	21 (31.3)	28 (100.0)	***<0.001***
-Terlipressin Use	6 (9.1)	3 (10.7)	*1.0*
Haemodynamic Parameters			
-Mean Arterial Pressure (mmHg)	77.25 ± 12.78	70.73 ± 12.22	***0.024***
-Systolic Blood Pressure (mmHg)	108.5 ± 20.1	99,5 ± 17.11	***0.031***
-Diastolic Blood Pressure (mmHg)	61.7 ± 13.1	56.3 ± 13.5	*0.11*
Helicobacter Pylori	7 (10.4)	1 (3.6)	*0.43*
CRP (mg/dL), admission	22.6 [0.5-286.9]	55.1 [0.9-310.6]	***0.004***
Albumin (mg/dL), admission	29.6 [17.0-39.2]	27.5 [10.3-37.8]	***0.014***
CRP/Albumin ratio, admission	0.9 [0.2-8.5]	2.6 [0.5-10.7]	***0.002***
Hemoglobin (g/dl), admission	8.7±2.3	8.6±2.1	*0.97*
Platelet (10^9/l) , admission	183 [34-531]	143 [27-665]	*0.29*
INR	1.3 [1.1-2.6]	1.8 [1.2-12.0]	***<0.001***
Lactate (mmol/L), admission	1.6 [0.6-1.1]	4.0 [0.7-16.6]	***<0.001***
Scores			
-APACHE II, admission	18.0 [2.0-45.0]	38.5 [13.0-53.0]	***<0.001***
-SOFA, admission	1.0 [0.0-8.0]	6.5 [1.0-13.0]	***<0.001***
-GCS	15.0 [5.0-15.0]	8.5 [3.0-15.0]	***<0.001***

CRP: C-reactive protein, INR: international normalized ratio, APACHE: Acute Physiology and Chronic Health Evaluation, SOFA: Sequential Organ Failure Assessment, GCS: Glasgow Coma Scale

Table III. Relationship between lactate levels and vasopressor use

	Vasopressor (+) (n=49)	Vasopressor (-) (n=46)	p
Lactate Level (mmol/L) (min-max)	2.73 (0.74-16.55)	1.50 (0.59-7.08)	**<0.001**
Min: minimum, Max: maximum			

dures such as sclerotherapy, band ligation, and hemoclip application are also given. The mortality rate was found to be the highest in patients with active bleeding, with 76.9%. The ROC analysis was performed on the predictive ability of INR and lactate levels for in-hospital mortality. It was found that both INR and lactate levels could predict in-hospital mortality (Figure 1). The cut-off value for lactate was found to be 2.42 with 82.1% sensitivity and 76.1% specificity, and the cut-off value for INR was 1.47 with 71.4% sensitivity and 62.7% specificity.

Table IV. Cox-regression analysis of factors related to in-hospital mortality

	Hazard Ratio	95% Confidence Interval		p
Model 1				
Age, years	0.99	0.96	1.02	0.60
Sex, Female	0.97	0.37	2.56	0.95
Multimorbidity	1.53	0.52	4.53	0.44
Upper GI bleeding	0.62	0.26	1.47	0.28
Lactate	1.29	1.13	1.46	***<0.001***
Model 2				
Age, years	0.99	0.97	1.00	0.83
Sex, Female	0.67	0.27	1.68	0.40
Multimorbidity	0.75	0.28	2.02	0.57
Upper GI bleeding	0.47	0.20	1.09	0.080
CRP/Albumin ratio	1.10	0.95	1.28	0.20
Model 3				
Age, years	1.00	0.97	1.03	0.91
Sex, Female	0.63	0.25	1.57	0.32
Multimorbidity	0.81	0.32	2.05	0.65
Upper GI bleeding	0.51	0.21	1.23	0.13
INR	1.41	1.16	1.70	***<0.001***

GI: gastrointestinal system, CRP: C-reactive protein, INR: international normalized ratio

Table V. Endoscopic findings of the patients, interventions performed and detected causes of bleeding

Endoscopic Finding	Survival (n, %)	Non-survival (n, %)	Mortality Rate (%)
Active bleeding observed	3 (4.5%)	10 (35.7%)	76.9%
Therapeutic intervention performed (sclerotherapy, band ligation, hemoclips)	12 (17.9%)	5 (17.9%)	29.4%
Ulcerative lesions without active bleeding	20 (29.9%)	3 (10.7%)	13.0%
Gastritis/Erosions (antral/pangastritis, bulbitis)	15 (22.4%)	2 (7.1%)	11.8%
Varices (esophageal/gastric ± ligation)	14 (20.9%)	7 (25.0%)	33.3%
Mass/Tumor (gastric, duodenal, intestinal)	6 (9.0%)	1 (3.6%)	14.3%
Diverticular disease	17 (25.4%)	8 (28.6%)	32%
Others	7 (10.4%)	0 (0.0%)	0.0%

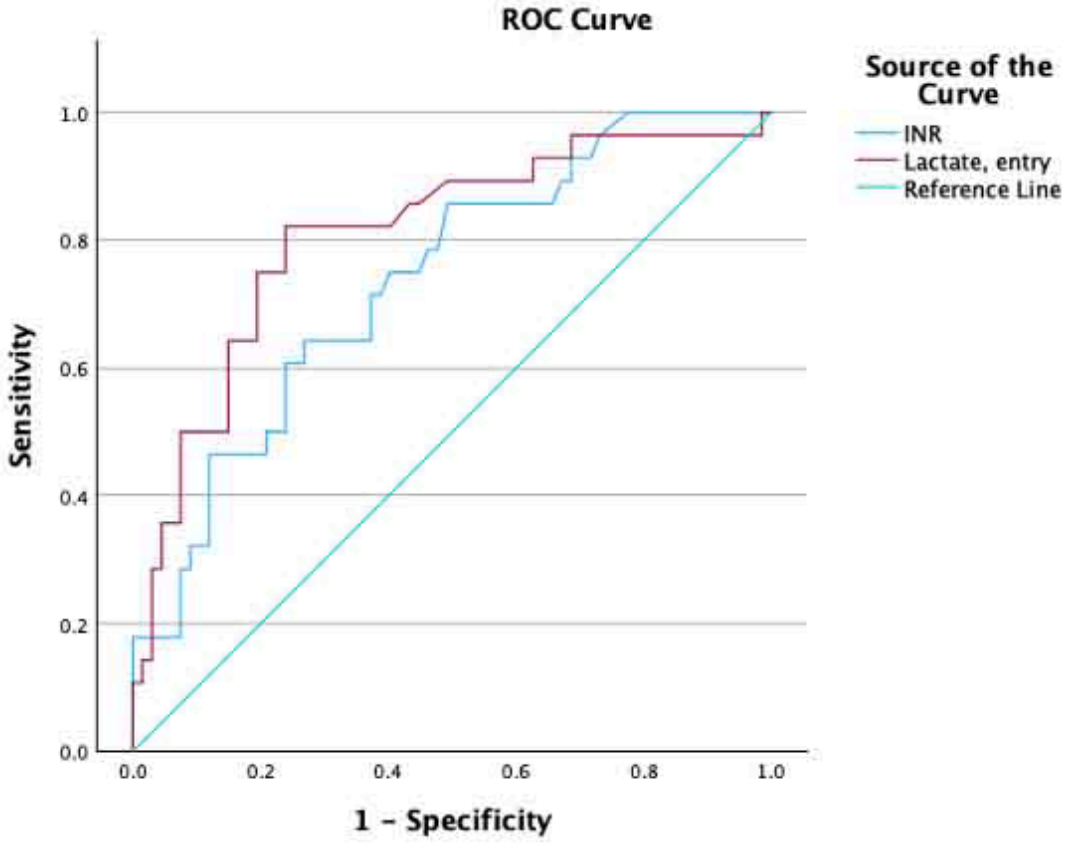

Figure 1. Receiver operating characteristic curve (ROC) for prediction of in-hospital mortality in critically ill patients admitted to the ICU with GI bleeding. For lactate; area under curve (AUC): 0.808, 95% confidence interval (CI): 0.708-909, p<0.001, for INR; AUC: 0.736, 95% CI: 0.630-0.843, p<0.001.

DISCUSSION

There are few studies on patients with GI bleeding admitted to the ICU. In our study, lactate and INR levels measured in patients with GI bleeding admitted to the ICU were revealed as independent risk factors in predicting mortality in the patient group who died.

The mortality rate of the patient group in our study was 29.5%. In the study conducted by Kuşcu et al. on 176 patients, mortality was found to be 52.27% (7). According to the literature, mortality rates ranging from 8% to 10% have been reported in different studies in patients admitted to the ICU due to acute GI bleeding (3).

The multimorbidity rate was high in the group of patients who died, as expected, and was consistent with the literature. Studies have also stated that upper GI bleeding is more severe and the mortality rate is higher in patients with advanced age and medical problems (8). Upper GI bleeding is among the most common GI emergencies with an average mortality rate of 10%. One of the most common causes of upper GI bleeding are esophageal varices. Apart from this, peptic ulcer and gastritis are also common causes (9, 10). The high morbidity and mortality rates of esophageal variceal bleeding despite the developments in diagnosis and treatment methods may explain the high mortality rates in upper GI bleeding in the literature (11). Unlike the literature, the mortality rate was found to be higher in patients with lower GI bleeding in our study. This may be due to the limited number of patients with lower GI bleeding in our study and therefore the limited sample size.

Previous studies have shown that gastrointestinal bleeding is an important cause of death in patients with renal disease (12). In this respect, our study supports the literature specifically for intensive care patients, in line with the data we have.

Mechanical ventilation is a known risk factor for GI bleeding in patients hospitalized in the ICU. Current literature identifies mechanical ventilation as a risk factor for GI bleeding (13, 14). In our study, the effect of mechanical ventilation on mortality in patients with GI bleeding was investigated, and the literature provides very limited data on this subject. Our study revealed that mortality was higher in patients with GI bleeding who were admitted to ICU while on mechanical ventilation, whereas the number of days on mechanical ventilation was not an independent risk factor for mortality.

Studies have shown that RBC transfusion is associated with increased hospital mortality in patients with bleeding. Furthermore, accumulating evidence suggests that a liberal RBC transfusion strategy in critically ill patients

is associated with increased mortality (15). Our findings support these data. In our study, a significant increase in mortality was found as the amount of RBC and platelet transfusion increased. There are also other studies that have shown that a restrictive transfusion strategy, such as the one we used, significantly improves outcomes in patients with GI bleeding compared to a liberal transfusion strategy (16). Therefore, we recommend a restrictive transfusion strategy.

There are studies indicating that elevated blood CRP levels correlate with adverse prognosis and heightened mortality in patients experiencing upper gastrointestinal hemorrhage, a trend was also observed in our study (17). The CRP/albumin ratio, which has been widely used recently, is a new generation indicator of inflammation and has been shown to be useful in elderly patients, various types of cancer and sepsis (18, 19).

In our study, INR and lactate levels were determined as independent risk factors for mortality. According to the literature, lactate levels are associated with mortality and morbidity in intensive care, trauma and sepsis patients (20). In the study conducted by El-Kersh et al., patients with upper GI bleeding admitted to the ICU were examined, and the median lactate level of surviving patients was found to be 2.0 mmol/L, and the median lactate level of patients who died was found to be 8.8 mmol/L (21). The notion of tissue hypoperfusion, despite enhanced hemodynamics, is corroborated by clinical research indicating tissue hypoperfusion, as demonstrated by lactic acidosis and diminished mixed venous oxygen saturation, even when vital parameters such as blood pressure, heart rate, and urine output are normalized (22). In our study, the lactate level being above 2.4 mmol/L seems to be important in predicting mortality as an independent risk factor. In addition, the lactate level increases due to hypotension and subsequent tissue hypoperfusion. Vasopressors are included in the treatment of hypotensive patients (23, 24). The relationship between vasopressor use and lactate levels revealed in our study confirms this situation.

In the study by Kuşçu et al., the INR level was higher in the groups that died in patients with GI bleeding compared to the survivors. It should not be forgotten that an elevated INR may reflect not only coagulopathy due to critical illness, but also be influenced by ongoing anticoagulant therapy or underlying liver dysfunction. Therefore, while elevated INR levels have been shown to predict increased mortality risk in critically ill patients, it is essential to interpret this parameter within the clinical context of each individual. Detailed assessment of the patient's medication history, particularly the use of anticoagulants, and evaluation for pre-existing hepatic conditions such as cirrhosis are crucial to avoid misinterpretation and to ensure appropriate clinical decision-making. We assumed that this situation would lead to an increased risk of GI bleeding and the results supported our hypothesis.

Studies comparing patients who developed GI bleeding in the ICU and patients admitted to the ICU with GI bleeding are quite important and a shadowy subject. The fact that these two conditions arise from different pathologies requires further study.

Limitations

Our study has limitations. The first limitation is the retrospective study design. Another limitation of our study is that there were not many patients from different medical centers. It would be appropriate to conduct longer-term and multicenter studies to generate more data on this subject.

CONCLUSION

We think that the follow-up results of patients admitted to the ICU with a diagnosis of GI bleeding may be different from those of patients who bleed in the ICU. According to the results of our study, INR and lactate levels may be predictive of mortality in these patients. Multicenter and prospective studies with a larger number of patients are needed to clarify this issue.

Ethics Committee Approval

This research complies with all the relevant national regulations, institutional policies and is in accordance the tenets of the Helsinki Declaration, and has been approved by the Akdeniz University Medical Faculty Ethical Committee, Akdeniz University (approval number: KAEK-520).

Informed Consent

It is a retrospective study, patient consent was not obtained.

Author Contributions

Concept - F.T., Ö.Ç.; Design - F.T., Ö.Ç.; Supervision - F.T., Ö.Ç.; Resources - F.T., Ö.Ç.; Materials - F.T., Ö.Ç.; Data Collection and/or Processing - F.T., Ö.Ç.; Analysis and/ or Interpretation - F.T., Ö.Ç.; Literature Search - F.T., Ö.Ç.; Writing Manuscript - F.T., Ö.Ç.; Critical Review - F.T., Ö.Ç.

Conflict of Interest

The authors have no conflict of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

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